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VIEWS, NEWS AND INTERVIEWS.

According to the annual report of an English distilling company, great progress has been made by their technical manager in the ageing of brandy by electricity, which, it is said, will enable the directors to dispose of their brandy at advantageous prices within 18 months after distillation. The process consists of the application of ozonized compressed air to the spirit while it is under the influence of an electric current.

Mr. Berthelon, the illustrious French chemist, suggests as a subject for the attention of the next generation of engineers the substitution of the heat of the sun, or the central heat, as a source of energy, for that derived from coal. The sinking of a shaft three or four kilometers deep is not beyond the power of modern and especially of future engineering. At such a depth, water would be found with a temperature of 160 degrees to 200 degrees Centigrade, which would develop enough power for any number of machines. This power would be available in any part of the globe, and many thousands of years would pass away before this store of energy would suffer an appreciable diminution.

In the recent computations for the electric light plant a mistake of $2,700 was made, not counting the chimney; and in another place it has been discovered that $3,000 was credited where it should have been $3,500. This, it is understood, will more or less affect the total estimated cost of the plant.—*Hamilton, O., News.* It would be funny if such trifling errors had any other effect.

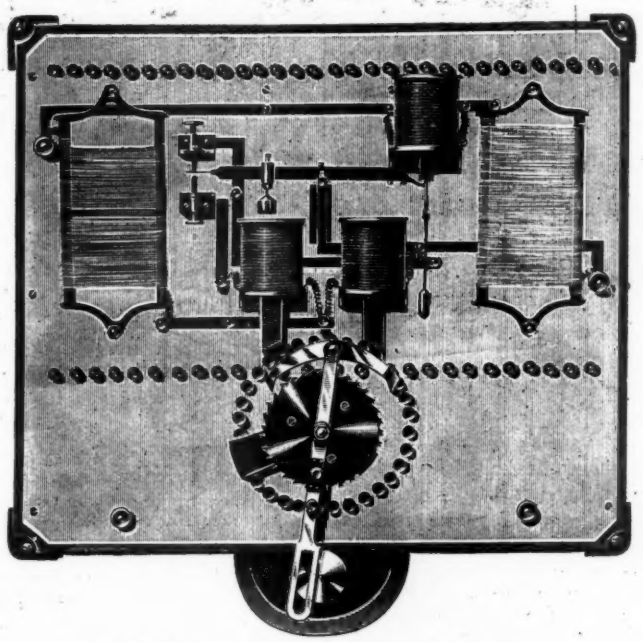
One of the ways in which the electric light is a benefit is that it lessens the breakage of street lamps, the bill for which amounts to thousands of dollars every year. The number of street lamps which were broken by hoodlums, in the days when Boston was almost entirely lighted by gas or oil, was something enormous, but this number has steadily decreased as the electric lights have increased, and the breakage this year—9,223 lamps—is the smallest for more than 10 years. In those 10 years 124,994 lamps were broken, a good proportion of them simply through mischief. It used to be a common thing for 100 broken lamps to be reported by the lamplighters when they had ended their rounds, and a large number is still reported each day, especially in those sections where the lighting is still done with oil or gas.

Of late the naturalists have been losing sleep and filling a great deal of valuable magazine space in discussing the causes that produce the light emitted by fireflies. As is generally the case where much study and investigation is involved, there is a wide difference of opinion. One school of scientists trace the phenomenon to the nervous system of the insect; another to his respiration, while a third school have prepared an article of 6,000 words to prove that the light is entirely dependent upon the poor bug's circulation. The burden of evidence seems to be in favor of those who claim that the luminous tissue is made up of fat globules, which are intermittently acted upon by the oxygen of the air and the phosphorus of the creature's body.

The Henrion Automatic Dynamo Regulator.

The Henrion automatic regulator, which is illustrated in the accompanying engraving, taken from London *Industries and Iron*, is an apparatus which permits of the installation of incandescent lamps in cases where the motive power is subject to even considerable changes of speed, such as in saw mills or pulp works, where hydraulic motors are employed and the head of water is apt to vary, in paper mills and similar instances.

A double pawl is actuated by a crank system driven mechanically, two detent teeth are rigidly connected in opposite sense, and these are carried by the link bar shown in the bottom of the illustration. A horizontal lever carries at one of its extremities a soft iron armature, which can be acted upon by a solenoid when the same is excited. The resulting attraction is counterbalanced by an adjustable weight on the principle of a Dutch steel-yard, and under normal conditions, when the pressure is neither much above or much below the standard value, the contact on the lever oscillates between the two contact screws. If a change in pressure takes place the lever causes the contact spring to come up against one or other of the contact screws, and so closes the circuit of one or other of two electro-magnets. The arrangement described is therefore a true relay or brain to the apparatus.



THE HENRION AUTOMATIC DYNAMO REGULATOR.

The double pawl is attracted by one or other of the electro-magnets when the relay acts, falling either to right or to the left. One or other of the teeth therefore engages with the toothed pinion. As one or other of these is moved, the pinion is rotated and operates a switch lever, controlling the resistance in the exciting circuit of the machine. That resistance is so arranged that by the automatic adjustment the pressure is maintained at a constant value, despite the variations in speed. The relay can be so constructed that, like voltmeters, the differential action regulates the pressure for a constant value at any desired point in the distributing network of supply without it being necessary to bring a pressure or pilot wire back from that point to the generating station.

To give an indication of change of pressure in a central station, the relay of an automatic regulator is utilized to bring into action two bells having gongs of different pitch or timbre, one being the signal for a minimum of pressure and the other for an increase above the normal. The bells may be replaced by two incandescent lamps on the Edison system, the one blue and the other red; as one or the other lights up it is known that the pressure is either too high or too low. If desired, both the systems of indicators may be used conjointly, so as to attract both eye and ear.

Stockholders of the Williams' Valley Light, Heat and Power Company, of Lykens, Pa., have instituted proceedings in the Dauphin County Court against other stockholders and officers, alleging fraud, negligence, exorbitant and false charges, asking for the appointment of a receiver.

ELECTRIC RAILWAY NOTES.

A project is on foot to construct an electric railway to the top of Mount Snowden, in Wales.

W. J. Grambs has been appointed receiver of the Grant street electric railway, of Seattle, Wash.

Tucson, Ariz., objects to a new street railway if T rails are to be used. Flat rails will be welcomed.

Final efforts are being made for the building of the Frederick and Middletown, Md., electric railway.

A jury awarded $10,000 damages to the Frederick Turnpike Company for the right of way of the City and Suburban Company's electric line to Catonsville, Md.

According to Mayor Schieren the city of Brooklyn, N. Y., has no power to compel street railway companies to use safety fenders on their cars. But that doesn't constitute a valid excuse for not having fenders.

One of the big driving wheels in the works of the Louisiana Electric Light Company, at New Orleans, burst on August 28. One man was injured, Superintendent McGrath, who had charge of the plant.

The City Council has granted a five years' franchise to the Grand Island, Neb., Light and Power Company for an incandescent light plant. The company has already filed its acceptance and the promoters have started East to secure machinery. One thousand lights have already been contracted for.

Unless State Attorney Doolittle changes his opinion in regard to where the responsibility rests for the accident which occurred on Sunday, August 5, resulting in the death of Councilman Anson K. Brown, the officers and directors of the Winchester, Conn., electric road stand an excellent chance of being prosecuted for manslaughter.

The West End Street Railway Company has declared a one and one-half per cent quarterly common stock dividend, payable October 1. Books close September 15 and re-open October 1. It is not the intention hereafter to pay dividends quarterly, but to change the time of the semi-annual payment of dividends on the common stock to October and April, instead of January and July, as heretofore.

There was a hearing in the Superior Court at Hartford, Conn., last week upon the complaint of the New York and New England Railroad that its track between Bristol and Plainville is being paralleled by the Bristol and Plainville Tramway Company. The road alleges that the statute regarding electric roads prohibits paralleling of steam railroads. The hearing also involves the question whether, under the law, a tramway can be built from one town to another without public necessity being first shown. The suit is regarded as a test case, as it is the first since the new law was passed.

After several months of negotiations the property of the Detroit Citizens' Street Railway Company has passed into the hands of Messrs. R. T. Wilson & Company, bankers, of New York, who have purchased a large majority of the stock under the terms of a contract made by the old company with Thomas Nevins, of Orange, N. J. The consideration for the stock purchased is not stated, but it is believed to be upward of $500,000, besides which the purchasers relieve the company of considerable outstanding indebtedness. New directors were elected, and Colonel J. M. Howards, of New York, was elected president and R. T. Wilson, of New York, treasurer.

PERSONAL.

Mr. A. H. Patterson, of the Phœnix Glass Company, returned to New York last week after an extended European trip.

Mr. Geo. A. McKinlock, president of the Central Electric Company, has returned to Chicago after a few days of recreation, and will soon make a visit to New York city.

Mr. H. Sellers McKee has resigned the presidency of the Pittsburgh, Pa., and Birmingham Traction Company. Dr. John M. Duff has been elected president. Mr. McKee is still a director of the road.

Prof. William A. Anthony has associated himself with Mr. Edward P. Thompson, 5 Beekman street, New York. These gentlemen will act as patent experts and consulting engineers in electrical and other cases.

Col. Samuel M. Bryan, president of the Chesapeake and Potomac Telephone Company, of Washington, D. C., renewed many acquaintances in New York last week and favored the ELECTRICAL REVIEW with a pleasant call. Col. Bryan was for 11 years officially connected with the Japanese government in the organization of its postal service and in the construction of many vessels. He is naturally greatly interested in the present unpleasantness between China and Japan.

Ancient Grecian Knowledge of Magnetism.

Dinocrates, a Greek architect, of the time of Alexander the Great, designed a temple to Arsinoe, wife of Ptolemy II, King of Egypt. The roof of the building was to have been composed of a mass of loadstones, strong enough to hold floating in the air, and suspend within it, an iron statue of the queen.—*Encyclopedia Britannica.*

Eighteen Mile Water Power Transmission.

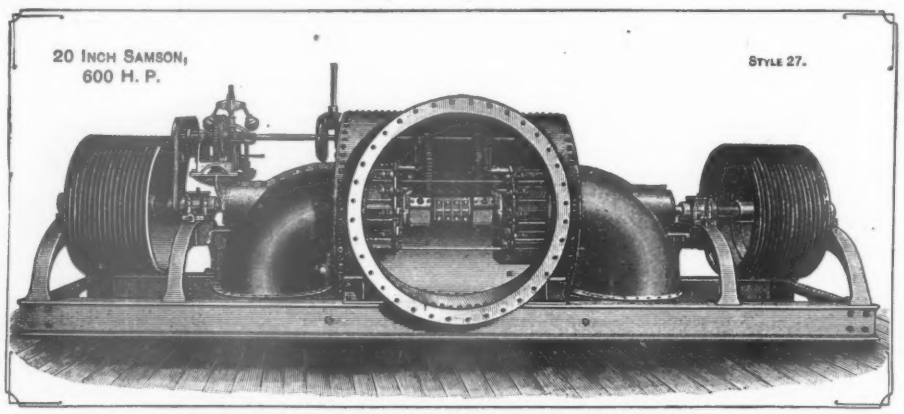
The illustration herewith represents a pair of turbine wheels of the type on horizontal shaft. Various modifications of turbines and water motors have in recent years been applied to the utilization of water powers heretofore thought impracticable, but which have become available through the introduction of the electrical system of transmission. Water powers located at inaccessible points can be made to furnish or transmit the power to places of convenience, where it can be utilized for any purpose in demand, the distance of such transmission being limited only to cost of the transmission line, the generator and the motor, long lines, of course, sacrificing to a greater or less extent the available effect, but frequently are desirable even at considerable loss of power.

The illustration shows one pair of a plant of three pairs of water wheels at the Falls of Juanacatlan, Mexico. Each of these pairs is rated at 600 horse-power, or, approximately, an aggregate of 1,800 for the three pairs, but two pairs only are in constant use, the other pair being held as a reserve power and to be used in case of accident in the motive power plant. The distance over which the power is transmitted is nearly 18 miles, being situated over 17 miles from Guadalajara, one of the largest cities in the Republic of Mexico, to which point this power is carried and the electric lighting of the city accomplished.

These 20 inch Samson turbines, which are built by James Leffel & Company, Springfield, Ohio, are placed under a head of 60 feet, and are producing remarkably fine results. They combine a number of new features and important improvements adapted to turbine use, and their automatic regulation has proven highly satisfactory. They represent the highest art in turbine building, the wheel, or runner proper, being made of bronze, the shafts of the best hammered scrap wrought iron, and other parts of the combination requiring strength are made of steel, the whole design being of the most perfect construction.

The transmission of the power from the turbines is made to an intermediate line shaft, from which shaft the power is taken to the generators, and is accomplished by the modern hemp rope improved transmission. The ropes are of the continuous style, passing from a groove in the pulley on the water wheel shaft to a groove in the pulley on the main power line, and from that groove returning again to an adjacent groove on the water wheel pulley, and from thence to another groove on the main line, thus returning back and forth until 16 grooves are filled on the water wheel shaft. In order to keep the rope taut, a carriage is placed between the pulley and the water wheel shaft on the main line, to which is attached a counter weight; this carriage pulls back and forth somewhat upon the cable railway plan, thus easily and nicely effecting a uniform tension in the rope in all conditions of the atmosphere and under all variations of power given by the wheels.

The illustration shows that the power is taken from the pair of 20 inch water wheels by two of these rope pulleys, one placed on each side of the pair of wheels. Of course, the same arrangement is observed in both of the other pair of wheels, all being connected to the same main intermediate line shaft, from which the power is belted to the generators.



NEW TWIN DOUBLE DISCHARGE JAMES LEFFEL SAMSON WHEEL.

New Contracts Awarded.

A contract for the complete work for the West End Street Railway Company's Boston subway system has been awarded the National Conduit Manufacturing Company, of New York. This contract will amount to about $60,000. The National Conduit Manufacturing Company feel very much elated over this, as they were brought in direct competition with every style of conduit system that is in use to-day.

The Berlin Iron Bridge Company, of East Berlin, Conn., have received the contract for an annealing room building for the Naugatuck Malleable Iron Company, at Naugatuck, Conn. The building is 94 feet wide and 175 feet long, with brick walls and iron roof trusses covered with corrugated iron.

A Satisfactory Belt.

Chas. A. Schieren & Company, 45 Ferry street, New York, have just received the following testimonial letter from the J. I. Case Threshing Machine Company, Racine, Wis.:

"We have had your perforated belt in use ever since you sent it and it stands the work in good shape. We use it in a place where it tries the belt thoroughly and it is perfectly satisfactory."

New Automatic Alarm System of the Electric Heat Alarm Company.

The great strides made during the past few years in the perfection of automatic fire alarm apparatus are pretty generally well known, and the very general adoption of an electric system for this important service has already materially reduced the insurance rates on plants so covered.

No one better appreciates the value of an automatic alarm service than the insurance men, and they are taking the matter up with great earnestness and offering substantial inducements for its installation.

The Electric Heat Alarm Company, of Boston, Mass., have long been prominently identified with this line of work, and their marked success in the field already covered has led them to produce a new system, intended expressly for mills and other large plants where considerable machinery is in operation.

This is called their "journal bearing alarm system," and its general features will be readily understood from the illustrations herewith.

Fig. 1 shows the manner in which the apparatus is applied to the journals on a line of shafting, and Fig. 2 represents the special switchboard by means of which the particular journal in which the danger lies can be instantly located.

The operation of the system is extremely simple, and, briefly, is as follows: Thermostats are placed directly on the bearings of the various lines of shafting and connected with the central switchboard, which has numbered contacts, corresponding to the number of journals on which the apparatus is placed.

An electric bell operated by a couple of batteries is also in the circuit, and when any journal becomes overheated the mercury rising in the cup of the thermostat makes a contact with the screw at the top and rings an alarm.

The engineer then steps to the switchboard to locate the trouble. The wires running from all the thermostats are connected to the central ring in the switchboard, and the lever in its normal position makes a contact with this ring through a short spring between two of the numbered contacts representing the various journals. By turning this lever until the bell rings the seat of trouble can be instantly located, as the number on the spring which in contact with the lever causes the bell to again ring is the one needing attention.

As soon as this is located the lever is thrown backward or forward in order to break the circuit and save the battery; the thermostat is removed from the heated journal and allowed to cool, after which it is replaced, the lever returned to its normal position and the apparatus is again ready for service.

The thermostats on the various shafts are not adjusted to any given degree of temperature, but can be regulated to meet any conditions they may encounter.

As an instance of the value the insurance men attach to this device, the case of the large saw mills of Johnson & Howe at Amery, Wis., may be cited. Their plant was destroyed by fire in September, 1893, and has just been rebuilt on a larger scale.

The Electric Heat Alarm Company equipped the new plant with a complete system of this kind, putting in 97 thermostats. One immediate result was a saving of 25 per cent on their insurance premium.

The value of a device of this kind in our large manufacturing plants where miles of shafting is in operation and where it is out of the question to keep all the bearings under constant supervision, cannot be overestimated, and if an ounce of prevention is worth a pound of cure in most cases, it is worth several pounds where fire risks are concerned.

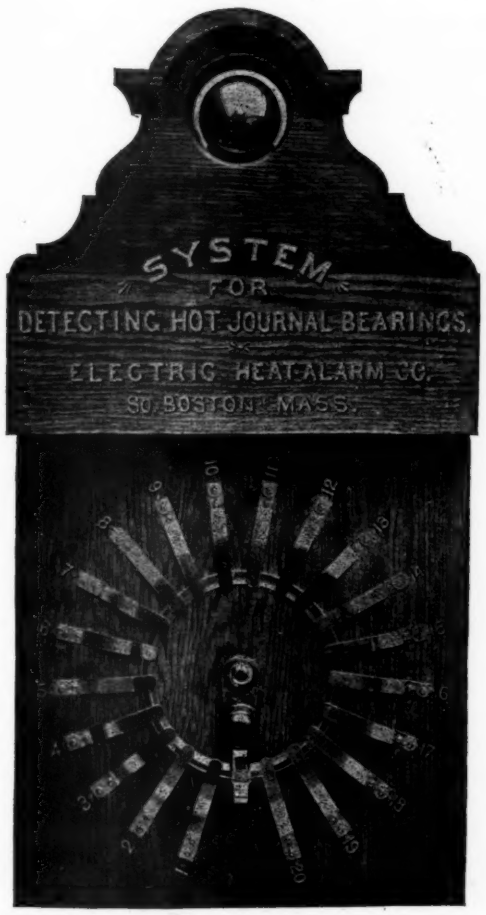


FIG. 2.—SWITCHBOARD FOR ELECTRIC HEAT ALARM COMPANY'S SYSTEM.

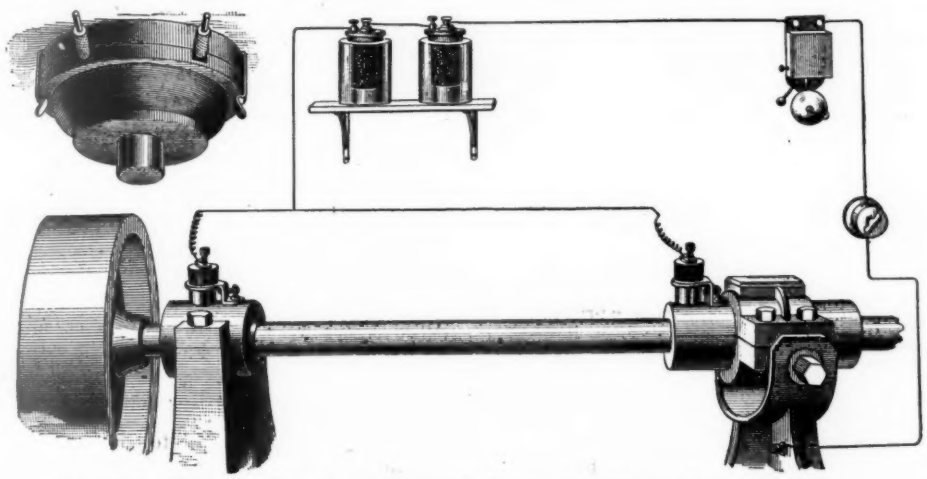


FIG. 1.—THE ELECTRIC HEAT ALARM COMPANY'S SYSTEM APPLIED TO A LINE OF SHAFTING.

New York Electrical Society Calls on Buffalo Bill.

A party of ladies and gentlemen including 200 members of the New York Electrical Society last Thursday evening accepted the courteous invitation of the Edison Electric Illuminating Company, of Brooklyn, N. Y., to visit Buffalo Bill's Wild West Show, at Ambrose Park, South Brooklyn, for the purpose of inspecting the electric lighting features of the place and witnessing the exciting performance. Mr. W. S. Barstow, general superintendent of the Edison Electric Illuminating Company, acted as host and made a speech of welcome in front of a cage full of buffalos, who regarded the electrical sharps with mild interest. President Mailloux, of the society, proposed a vote of thanks to the Edison company, which Mr. George M. Phelps suggested be topped off with three cheers. The cheers were given with a fervor that made the Sioux Indians blush through their costumes of paint. After an inspection of the neat generating station the party divided, some going up on the roof of the arena to see how the search-lights were worked and others taking grand stand seats with the ladies to witness the thrilling features of the interesting performance. Between professional enthusiam over the working of the search-lights and the excitement of the conflict in the arena, several of the younger members of the society narrowly escaped falling off the roof. There were no mishaps, however, and most of the party was collected after the performance to have a flash light photograph taken.

The task of successfully lighting such a large area as the Wild West arena covers, and the necessity of having no shadows, was a difficult task to perform. But Mr. Barstow, by a judicious use and correct arrangement of reflectors, search-lights and arc lamps made by the Electric Construction and Supply Company, of New York, has accomplished the work to a dot. The arena is as light as day and all the difficult feats of horsemanship and sharpshooting performed by sunlight are equally well done at night.

The generating station is located in the rear of the arena and is built on piles. It was designed for a six months' temporary plant but will be added to in capacity and used again next season. There has never been an accident of any kind since the plant started. Steam is generated by two 250 horse-power Morrin "Climax" safety water tube boilers made by the Clonbrock Steam Boiler Works, of Brooklyn. There are two Ball engines, one 13x25x16 and the other 12x25x16, running at 237 revolutions and developing about 600 horse-power. Current is furnished by four Edison No. 32 generators of 150 horse-power each. The station is fitted with the usual instruments and controllers. About the grounds and in the arena are 800 incandescent lamps; seventy-seven 2,000 candle-power Ward arc lamps; 50 of the Electric Construction and Supply Company's reflectors, and three large search-lights. These are used to throw light on the horsemen and on the glass balls in shooting, the beam of light following as long as necessary the object at which it is aimed.

A British View of Our New Tariff Bill.

I have noticed "The American Tariff" as a headline in my paper every morning for weeks past. Sometimes it has headed a paragraph of a few lines only and sometimes a column or more. I have many times tried to make out what it is all about and what has really been done by the House of Representatives, the Senate, the Finance Committees, the Foreign Relations Committee, etc., and what would be the effect of Senator Murphy's resolution.

Now and again a leading article has appeared and I have hoped to gain some enlightenment therefrom. Usually, however, the writer of the articles has evidently been as much at sea in his deductions as I have been myself. The fact is that it takes a born American to understand the working of the legislative machine at Washington and to distinguish between bluff and business.

Having just had an opportunity of glancing at the bill for a few minutes, I hastily looked to see how it is likely to affect English electrical manufacturers. Nowhere, however, could I find anything concerning electrical manufactures. For instance, under the heading "Copper" there is given the tariff on sheet and bar copper, but wire is not mentioned. Under the heading of "Wire," iron and pianoforte wire alone are mentioned. There is no special heading for machinery, either electrical or otherwise, although steel ingots, forgings, boiler plates, etc., are dealt with. Electrical manufactures would, therefore, appear to come under the following clause: "Manufactured articles or wares, not specially provided for in this Act, composed wholly or in part of any metal, and whether partly or wholly manufactured, 35 per centum *ad valorem.*"

Incandescent lamps will probably have to pay at the same rate; as, whether the minute piece of platinum which they contain is sufficient to bring them under the above clause or not, does not matter, seeing that "all manufactures of glass, or of which glass is the component of chief value, not specially provided for in this Act," are also subject to 35 per cent *ad valorem.*

Thirty-five per centum *ad valorem* is, however, a considerable reduction, as the present tariff is 45 per cent. What the effect of this reduction will be, so far as concerns English electrical manufacturers, it is too soon to discover. It appears to me, however, that the reduction is not enough to be of any very material consequence. Certainly there is no ground for any great rejoicing.

Under the Act our American cousins will, for the first time, have the pleasure of paying an income tax, and, as a set-off against this, they have placed the following luxuries on the free list: Balm of Gilead, Bologna sausages, cider, old copper (electrical manufacturers please note), curling stones or quoits, and curling stone handles, divi-divi, old junk, manna, sauerkraut, sausage skins, snails, yams and zoffer.—*"Meteor" in London Lightning.*

Electrical Equipment of a Luxurious Yacht.

The ocean yacht building at the Bath, Me., iron works for Wm. Slater, of New York, might be called a gem if it were not for its size. In an electrical point of view it will be made, on occasion, a marvel of brilliancy. As to the boat in its appointments other than electrical, suffice it to say that $300,000, exclusive of furnishings, gives an idea of what a boat it may be. The electrical apparatus is on the same plan, the best regardless of expense. The plant, installed by J. A. Trates for the General Electric Company, consists of two 4 pole, 80 volt, 190 ampere direct connected machines, making 400 revolutions a minute. Sturtevant engines are used. At ordinary times one engine and dynamo will carry the whole load. For this purpose the circuits are arranged in a novel manner. The circuits feeding the lamps inside the vessel are connected to one machine, the search-light, signal lamps and decorative circuits are on the other, when the main knife switches are down. If now a knife switch is pulled the dynamo circuit is first broken and its load, when the switch is thrown way up, is transferred to the other machine. Before the change is made the total number of lights on all the circuits is reduced to the capacity of one machine. The wiring is concealed by specially designed mouldings in some cases, but is generally put out of sight without that help. The bell wires are like the others, Grimshaw, and laid in the same manner with carefully soldered joints. The switchboard has two enameled rheostats by the Bridgeport Electric Company. There is a Weston station ammeter for each machine and a voltmeter. A novel feature of the lighting of this yacht are two illuminating belts, to be used on the main boom and from the bowsprit over the masts. The searchlight has electrical connections through rings concealed in the base. The lamp can, therefore, be turned round and round without interfering with connecting wires. The illuminating belts of lamps and the searchlight will make the yacht a wonder by night as well as by day.

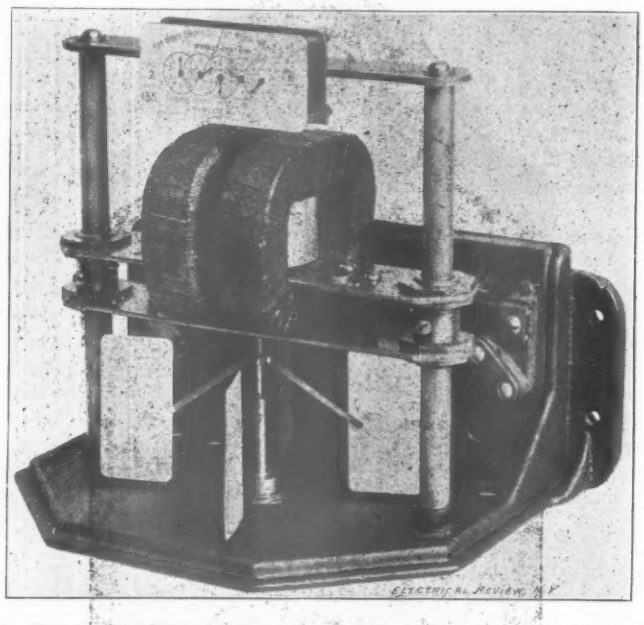


FIG. 1.—THE DUNCAN METER, MADE BY THE FORT WAYNE ELECTRIC CORPORATION, FORT WAYNE, IND.

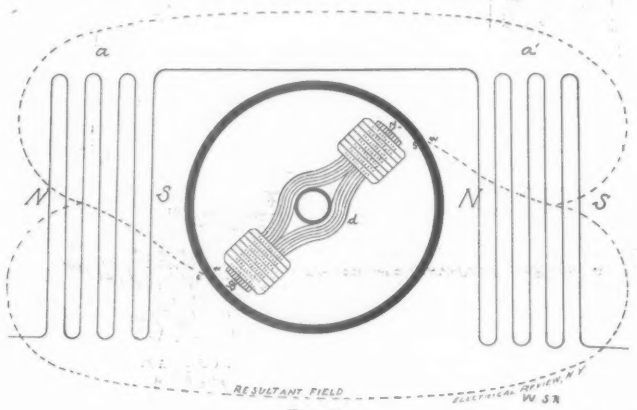


FIG. 3.

National Electric Light Association.

The Executive Committee of the National Electric Light Association met at the Hotel Brunswick, New York city, last night, to select a place for holding the next convention. Representatives of the various electrical journals met with the committee by request. These gentlemen compose the committee: H. H. Fairbanks, H. J. Smith, G. H. Blaxter, John A. Seely, E. F. Peck, A. J. De Camp, Charles R. Huntley, A. Markle and W. W. Carnes.

A movement is on foot whereby the McKeesport and Reynoldton, Pa., street car line may fall into the hands of the Hon. Tom. Johnson, of Cleveland, the big steel rail manufacturer.

DUNCAN METER FOR ALTERNATING CURRENTS.

BY WM. S. RESOR, B. S.

One of the problems which has confronted electrical engineers has been the invention of a commercial alternating current recording meter which will record "all" loads correctly.

The credit of having solved this problem must be given to Mr. Thomas Duncan, of the Fort Wayne Electric Corporation, Fort Wayne, Ind.

In the early days of electric lighting it was customary to charge so much per lamp per week, month or year, because there were no practical recording meters.

This was, of course, most unsatisfactory both to supply companies and to consumers. A recording meter was the dream of both.

Before long, various types of recording meters appeared, which recorded, it is true, but gave no satisfaction; for the greater part of them made electric light very cheap for the small consumers, and very expensive for the large, on account of the slow speed on a small number of lights, and the high speed on a large number. But each has in turn been succeeded by others, claimed to be better, and now the Duncan meter seems to have reached the end of the line, and combines the virtues of all and let us hope the defects of none.

This meter is dependent on the principle of the repulsion of a closed

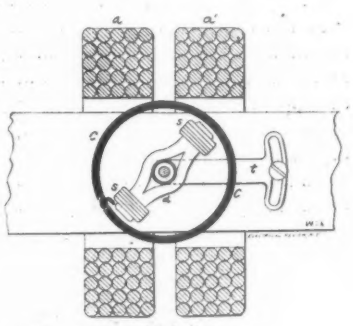


FIG. 2.

secondary from its primary, and is a thoroughly practical and efficient development of Prof. Elihu Thomson's classical experiments on that principle.

The essential parts of the meter are the primary or field coils *a*, *a*¹, (see Fig. 2), which are connected in series with the lamp circuit; the secondary or armature *c*, consisting of an aluminum cylinder, a magnetic path diverter *d*, made of laminated iron and carrying a closed secondary *s*, which consists of several copper punchings; the aluminum fans, the registering train and the spindle which carries said armature and fans.

A very important feature of this meter is that there are no brushes or commutator to get out of order, or other contacts to become dirty and oxidized.

The armature has no electrical connection with the circuit.

The motion of the armature or cylinder is due to the repulsion set up

against it as a closed secondary, from the primary or field coils a and a^1.

The action is explained more fully as follows: When the lamps are turned on the current flows through the coils a and a^1, and an alternating field is set up. This field is distorted or diverted from its natural direc-

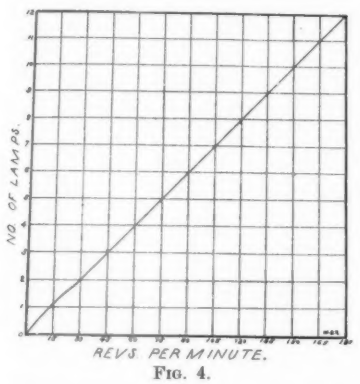


FIG. 4.

tion, along the axis of a and a^1, by the diverter d, and assumes a form similar to that shown in Fig. 3. Foucault currents are generated in the armature and also in the closed secondary on the diverter.

The use of this secondary on the diverter is to reverse its polarity.

Suppose we consider the instant when the polarity of the primary or field coils a and a^1 are as shown in Fig. 3, the flux as it cuts through the cylinder obliquely, and as shown by the dotted line, will develop Foucault currents in it, which will have poles as shown in the diagram, *i. e.*, a south pole on the outside circumference of the cylinder and facing the south pole s of the primary coil a, thereby setting up a repulsion, due to their being of the same polarity. Again, the north pole n, which is shown on the inner circumference of the cylinder, will be attracted by the south pole s of the diverter d. Therefore, the rotation is due to the repulsion set up by the two south poles on the outside of the cylinder, and the attraction between the two unlike poles inside. The

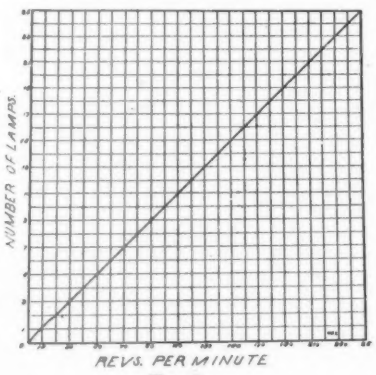


FIG. 5.

same condition exists on the other or right hand side of the cylinder, only differing in the change of polarity.

The closed secondary, which is divided into two, each half being placed upon the respective poles of the diverter d, is for the purpose of changing the original or induced polarity of said diverter, so as to obtain a maximum torque in effecting an attraction between the induced poles on the inner surface of the cylinder and the diverter.

If the axis of the diverter be placed along the axis of the coils a and a^1, or at right angles to it, there will be no motion, all the energy being expended in producing a lateral pressure on the shaft, but as soon as we move it from either of these positions, the force acts along a line which does not pass through the vertical axis, hence, we have motion whose speed depends on the size of the angle formed by the two axes. Forty-five degrees gives the greatest speed.

This meter is the only one upon the market whose speed curve is a straight line.

The following table contains the results of a test on a 12 light Duncan meter:

Number of Lamps.	Revolutions per Minute.	Initial Speed.	Per Cent Error.
1	14	14	6.6
2	30	15	0
3	45	15	0
4	60	15	0
5	75	15	0
6	90	15	0
7	105	15	0
8	120	15	0
9	135	15	0
10	150	15	0
11	165	15	0
12	180	15	0
13	195	15	0
14	210	15	0
15	225	15	0

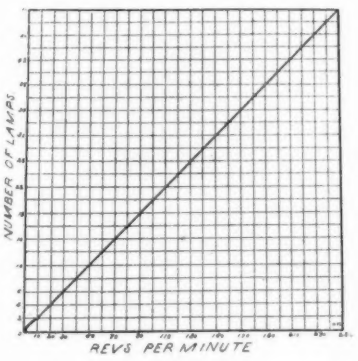


FIG. 6.

The speed on one light is a few per cent slow, on some as low as two per cent, but on all other loads the meter is correct. Fig. 4 shows the speed curve plotted from the above table.

Fig. 5 shows the speed curve for a 25 light meter and is plotted from the following table:

Number of Lamps.	Revolutions per Minute.	Initial Speed.	Per Cent Error.
1	9	9	10
2	20	10	0
3	30	10	0
4	40	10	0
5	50	10	0
6	60	10	0
7	70	10	0
8	80	10	0
9	90	10	0
10	100	10	0
11	110	10	0
12	120	10	0
13	130	10	0
14	140	10	0
15	150	10	0
16	160	10	0
17	170	10	0
18	180	10	0
19	190	10	0
20	200	10	0
21	210	10	0
22	220	10	0
23	230	10	0
24	240	10	0
25	250	10	0

Fig. 6 is the curve for a 50 light meter plotted from the data of the following test:

Number of Lamps.	Revolutions per Minute.	Initial Speed.	Per Cent Error.
1	4¼	4¼	15
2	10	5	0
4	20	5	0
6	30	5	0
8	40	5	0
10	50	5	0

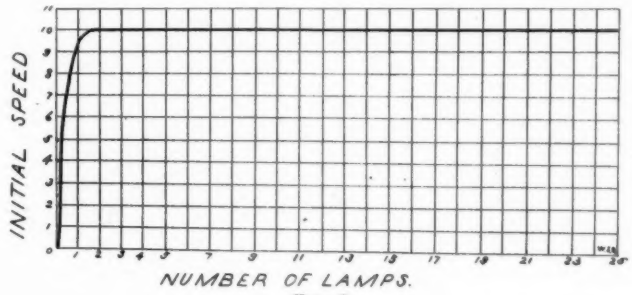


FIG. 7.

12	60	5	0
14	70	5	0
6	80	5	0
18	90	5	0
20	100	5	0
22	110	5	0
24	120	5	0
26	130	5	0
28	140	5	0
30	150	5	0
32	160	5	0
34	170	5	0
36	180	5	0
38	19	5	0
40	200	5	0
42	210	5	0
44	220	5	0
46	230	5	0
48	240	5	0
50	250	5	0

Fig. 7 is an initial speed curve for a 25 light meter, and shows the remarkable constancy which the meter maintains throughout its entire range.

Mr. Duncan has also applied this principle to meters for measuring and recording multiphase currents, and with particular success in the cases of two and three phase currents, also as a wattmeter for measuring the total energy.

Fig. 8 shows a two phase meter, and Fig. 9 a three phase.

A striking peculiarity of the multiphase current meter is that it can be operated with single phase currents by simply connecting its field coils in series or multiple arc, and in series with the lamps.

Fig. 1 shows a complete meter.

Dr. Charles H. Merz, who had an interesting article on "Telephonic Reminiscences" in a recent number of the ELECTRICAL REVIEW, is actively identified with the Sandusky, Ohio, Telephone Company. All communications for this company should be addressed to Dr. Merz. P. O. Box 252, Sandusky, Ohio.

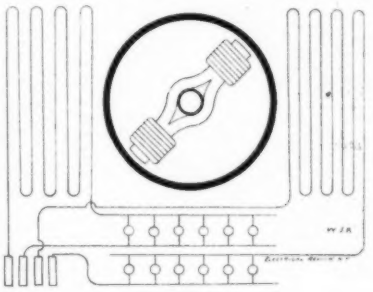


FIG. 8.

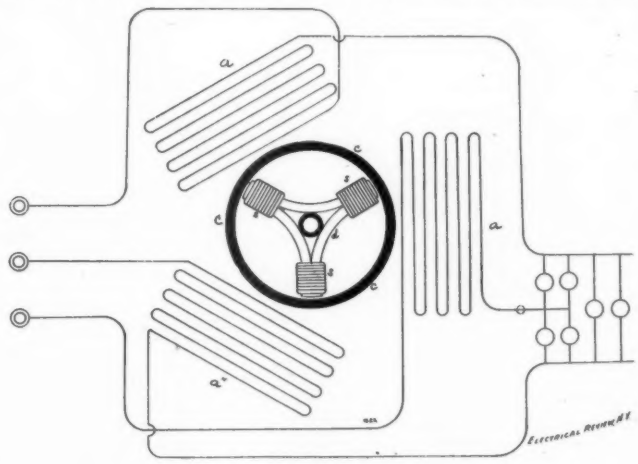


FIG. 9.

An Electric Railway Scheme the Subject of Western Repartee.

The Clark county surveyors have completed their work on the Springfield-Xenia Electric Railway and it is said that work will begin on the roadbed in a few days. We wonder if it will.—*Xenia Gazette.*

The impression prevails here that the bed was completed and the scheme put to sleep in it some time ago.—*Springfield, O., Gazette.*

What is the Sun?

[*From the Chicago Tribune.*]

Nikola Tesla is reported as saying that "the light of the sun is the result of electric vibrations in the ether that separates us from that luminary, and does not proceed from a great central fire, as the scientists have all along held." To this it may be remarked that the said vibrations must have some cause, and that commensurate with the effect, so that if the sun were only half as powerful as now he would not excite more than half the total of energy that now is expressed in vibrations between him and the earth. Furthermore, Tesla must be quoted incorrectly as saying the scientists have all along held the sun to be a great central fire. About the time Tesla was born it was pointed out that the material composing the sun is too hot to burn, and this statement is not gain-said by any astronomer who studies the chemistry of the sun.

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The ELECTRICAL REVIEW would like a photograph of the white man of Tennessee who was turned into a black man by a stroke of lightning, and who still lives and enjoys life. Two pictures are desired, in fact—one before and one after taking.

Get ready for Atlanta.

Keep your eyes on the Wenstrom patents.

"Trolley bounce" is the name of a new kind of soda water.

Business is improving and electrical circles are feeling the change.

The underground conduit electric railway is still in the future. It cannot be said to be in the ground.

Dr. Bleyer's interesting and graphic review of the points of interest in the development of the early knowledge of electricity is concluded this week.

The new tariff had little to do with electrical apparatus and allied manufactures. Still foreigners are watching the market here in this field very closely.

Inventors are pitching in again. The hard times of the past 18 months suppressed a great deal of inventive genius. But it only slumbered and is now awake again.

The State Street Railway Convention, to be held at Syracuse, September 18, promises to be largely attended. These conventions are growing in importance.

The electric light is now receiving a thorough test as an illuminant of race courses at night. A track on Long Island is being lighted this week. There is much interest in the result.

A labor agitator struck a Baltimore motorman because the latter wouldn't stop his car to let a parade of cloak-makers pass. This is the philosophy and logic of the professional agitator concretely expressed.

A Paterson, N. J., preacher has condemned trolley parties as breeders of immorality. The trolley has been blamed for many things and still survives. The mouthings of a sensational minister, who would better employ his time in practical work, will not affect this boon to civilization.

In the death of Prof. Hermann Von Helmholtz, the scientific world loses a man who for years has been its idol and master spirit. He was remarkable for his simplicity of life and character, and the lucidity and ease of expression of his thoughts. He was an ideal scientist of the purest type and a teacher of wonderful powers. He will be missed and mourned by many Americans who knew and loved him.

TROLLEY CARS AND SENSATIONALISM.

The lack of ideas in the editorial office of the New York *World* is painful. A woman reporter known as Meg Merrilies was sent to write a sensational article on the speed of the trolley cars running over the lines of the Union Railway Company from One Hundred and Twenty-ninth street and Third avenue to Fordham. A few sample paragraphs are given below to show the mental equipment of the "expert" selected for the work. This is the kind of drivel that filled nearly six columns:

"I do not know the legal rate of speed, but I feel sure that no ordinance was ever passed in this city allowing 20 miles per hour in the public streets."

"When I got on board there were five other passengers on the car. Three were men, smoking on the back seats, and one of them dropped his paper and looked at me as I took my seat in the forward part of the car."

"It was an open car, but a bar has been put up along one side, as I suppose, to keep people from being thrown off."

"I saw the motorman stretch an awning across the front of the car. This was a good idea, as I afterwards found out, as it prevented the passengers from being blown from their seats as the car rushed madly onward in the darkness."

"My watch was, I think, about three and one-half minutes fast, but that made no difference, as I have never, since I came to New York, been able to find out the exact time, and all the electric clocks differ."

"Trolley cars are cheap. I learn that they are being turned out by factories at so much per dozen with fare-indicators thrown in."

"One of the motormen told me with a feeling of bitter regret that he could not go as fast by day as by night, as in the daytime there are so many cars loaded that the electricity is used up quickly."

"After going around two or three curves at lightning speed, the motorman working all the time with his levers and ropes and making a fearful racket with the gong, I found that the proper caper among Fordham passengers is to brace their knees against the seat in front."

"It was impossible to read the names of the streets, even when the electricity from the trolley wire and from beneath the wheels flashed out on the darkness, illuminating the whole neighborhood with a weird blue light."

"These trolley companies are all making money. They are piling up millions. It costs less to run a trolley road by one-fourth than it would to run a horse-car road, and the wires can be extended indefinitely."

Isn't that lovely? Mr. Pulitzer and his ideas of journalism are certainly a feature of modern Metropolitan life. If only somebody would implicitly believe one item of news (?) appearing in his paper how happy Mr. Pulitzer would be!

How about those electric snow plows? Has everyone bought all he needs? They're cheaper now than when the snow flies.

DEATH OF PROFESSOR VON HELMHOLTZ.

THE EMINENT GERMAN SCIENTIST SUCCUMBS TO A SECOND PARALYTIC STROKE.

Prof. Hermann von Helmholtz, who was recently stricken with paralysis for the second time, died at Berlin, Germany, on September 8. Professor Helmholtz came to the United States as the Imperial German Delegate to the World's Congress of Electricians, and was made Honorary President of the Congress. At the close of the Congress Professor Helmholtz visited New York and Boston, where he was made the lion of the hour. He delivered a lecture on his discovery of the ophthalmoscope at the College of Physicians and Surgeons, in this city, on October 3, 1893. He spoke in English, and the many persons who had gathered to hear him listened with rapt attention. On the steamer returning to Germany Professor Helmholtz suffered a fall which it was feared at the time would prove serious. He rallied from its effects, however, in spite of his advanced age. A few weeks ago he had a paralytic stroke and a second one which caused his death occurred last week. Professor Helmholtz was unfortunate in two of his children, one of whom became insane. He leaves another son, however, who seems to have inherited his father's genius.

Hermann Ludwig Ferdinand von Helmholtz, the celebrated German physiologist and natural philosopher, the most distinguished man of his day in his special field of research, was born in Potsdam, Prussia, on August 31, 1821. He will figure in biographical dictionaries as Baron Hermann Ludwig Ferdinand von Helmholtz, for he was ennobled in 1883. His father was a teacher in the gymnasium at Potsdam, and his mother was the daughter of a Hanoverian artillery officer of the name of Penne, a lineal descendant of the famous William Penn.

In his seventeenth year Helmholtz entered the University of Berlin as a student and wished to devote himself to the study of physics, but circumstances compelled him to enter upon the study of medicine. He was favored in this by the liberal arrangements of the Frederick William Institute, an institution for the training of military surgeons, from which he was graduated in 1842. In 1847 he showed, in a small pamphlet entitled "The Conservation of Energy," that no energy is lost in the world, but that it alters only in its mode of manifestation. At the same time he demonstrated that all the processes of nature obey the laws of mechanics. Heat up to this time had been regarded as a "substance," but Helmholtz showed that "the phenomena of heat can all be looked upon as motion." Jacobi, the mathematician, was the only member of the Berlin Academy who at this time espoused Helmholtz's cause.

In 1851 Helmholtz astonished the scientific world by his discovery and description of the ophthalmoscope, an extremely ingenious apparatus for examining the retina in the living eye. His work from this time on contained further evidences of his genius. He made many important discoveries in physics and physiology, and in 1871 accepted the chair of physics in the University of Berlin. He then was chiefly engaged in inquiries in the great departments of hydro-dynamics and electricity.

Helmholtz began his researches in the electrical field by endeavoring to determine whether forces exist acting at a distance without an intervening medium. His aim "had been to determine in what direction experiments should be made to decide between the various theories. He succeeded in making such an experiment on the electricity collected on the surface of a conductor rotating in the magnetic field. This experiment decided in Faraday's favor." Faraday's second great problem, the relation between chemical and electrical forces, urged on Helmholtz to another series of valuable investigations. By means of the mechanical theory of heat he was able to calculate the effect of water on the electro-motive force in the case of a solution of salt. He then took up the thermo-dynamics of chemical process and solved the general problem, "What portion of the energy present in any system can be transformed into another kind?" He reached the result that all chemical compounds below their dissociative temperatures give off heat when produced in the reverse manner. The reflex effects of the ether and ponderable atoms on each other were shown in his work on "The Theory of Abnormal Dispersion." He introduced the conception of "electrical convection" in "The Transmission of Electricity by the Movement of Its Ponderable Conductors." These are but a few of the electrical researches made by Helmholtz.

In the Autumn of 1887 the German Empire founded a physical technical institution, Dr. Werner Siemens having given for the purpose a sum of $125,000. The institute comprises two departments, one for purely scientific purposes, and the other concerned with the application of scientific physics to technical purposes. The first is a laboratory for the advancement of pure science. The second department has for its object to develop technical scientific methods and appliances, and to keep industry abreast of the progress of science. Over this great and important new institution Helmholtz was chosen by the government to preside, while he was further appointed director of the first or purely scientific department. In consequence, he resigned the chair of physics and the directorship of the Physical Institute of Berlin, though he still retained the position of professor ordinarius in the university, and delivered lectures on special subjects of theoretical physics. In 1892 Professor Helmholtz attended the meeting of the British Association at Edinburgh, and lent the support of his name to a scheme for the internationalization of the fundamental electrical units.

PROFESSOR HERMANN LUDWIG FERDINAND VON HELMHOLTZ—DIED AT BERLIN, GERMANY, SEPTEMBER 8, 1894.

The electric railroad company which will operate the line between Rutherford and Hoboken, N. J., has not yet selected the site for a power house, being unable to find an adequate water supply.

Direct Cable to New York.

The new cable of the Commercial Cable Company, which was laid up New York bay on September 1 by the steamship "Mackay-Bennett," was spliced at Coney Island on September 9 to the line running to Canso, Nova Scotia, thereby making the first line of ocean cable actually landing in New York city. The joining at Pier A, North River, was made last week. The cable line now runs from New York city to Canso and thence to Waterville, which is on the southwestern coast of Ireland. Chief Electrician Charles Cuttriss sent to Canso the first message ever transmitted over a cable directly from New York. It was:

"Glad to be able to speak to you over new circuit direct from Manhattan Island."

The answer came back:

"Glad you are so successful. Hope in future we shall be entirely free from trolley troubles we have had for last year or two."

The replies were being sent by S. S. Dickenson, the general manager at Canso. Mr. Cuttriss then ticked:

"See no reason why we should be troubled with them again. Absolutely no indications of anything of the kind."

Wall Street and the Electrical Stock Market.

On the stock market the week opened with a sharp recovery, followed by slow reaction. Trading has been very dull. The bond market has been fairly active, but prices have been irregular. General Electric made a net gain for the week of ¼ point, the total sales being 6,855 shares. The highest price reached was 42 and the lowest 40⅝. Western Union sold up to 92 and down to 90⅛, gaining ½ point for the week.

The closing quotations of electric stocks on the Boston Exchange to-day were:

	Bid.	*Asked.*
Edison Electric Illuminating	120	—
General Electric	40¼	41
General Electric preferred	70	73
Westinghouse Electric	35	36
Westinghouse Electric preferred	53½	53⅚
Fort Wayne Electric	2⅝	3

New York, September 8.

GENERAL NOTES.

The incandescent electric light and gas light and coke companies of Seymour, Ind., have consolidated.

J. M. Boyd, receiver of the Ballard, Wash., Electric Light Company, has sold the property to George F. Gund, the mortgagee, for $2,810.58, the amount of his judgment lien with interest.

Charles A. Dana, editor of the New York *Sun*, will be the subject of a very comprehensive and interesting biographical study, by Edward P. Mitchell, Mr. Dana's chief associate on the *Sun*, in *McClure's Magazine* for October.

The Oswego, N. Y., Street Railway has been purchased by New York parties. It is stated that the transfers also include the People's Electric Light and Power Company's plant. The mortgages amounted to something over $100,000.

THE RISE OF ELECTRICITY.

AN HISTORICAL ESSAY BY DR. J. MOUNT BLEYER, OF NEW YORK, FELLOW OF THE ROYAL ACADEMY OF MEDICINE OF NAPLES, MEMBER OF THE AMERICAN MEDICAL ASSOCIATION, THE AMERICAN ELECTRO-THERAPEUTICAL ASSOCIATION, ETC.

[*Specially written for the* ELECTRICAL REVIEW.]

(*Concluded from page 117.*)

Again Europe was startled by a novel thrill of wonder and excitement.* The electrical sparks of the Abbé Nollet and the famous experiment of Leyden sank into insignificance before the sublimity of the new achievement. Franklin, the modest philosopher of half-savage America, snatching the thunderbolt from the skies with his kite and key, was the wonder of the hour. Kings became his disciples; princes flew kites in Summer showers and repeated the experiments; Europe was covered by a chain of iron points from Paris to St. Petersburg, and the study of the lightning became as universal as in the days of Etruscan superstition.

Franklin was covered with honors. The Royal Society of London, eager to repair its former neglect, elected him a member and awarded him its highest prize. In France, Russia, Germany, he was still more highly honored; he was the most famous of philosophers. From this time, too, until near the close of the century, the science of atmospheric electricity was studied by eager observers. The thunder-cloud was the favorite subject of learned inquiry. Brilliant hopes of further discoveries were entertained that were never fulfilled, and one eminent philosopher fell a victim to the dangerous research. Professor Richman, of St. Petersburg, had erected an iron rod in his observatory for the purpose of repeating the American experiments, and ventured too near the instrument; a sudden flash descended the conductor, struck him upon the head and passed through his body. He fell dead against the wall. He is remembered as the martyr of the science. Professor De la Garde, of Florence, was struck down by an unexpected shock, but recovered.† Yet danger seemed only to add new interest to the attractive study. Franklin invented his lightning rod, which was at once employed to protect the homes and the public buildings of Europe and America; and his disciples were everywhere engaged with kites and points in an effort to disarm the thunderbolt of its terrors.

The thunder-cloud was mapped out and described by countless observers. Lightning from its different forms was given different names.

Franklin and his innumerable disciples began now to extend their researches over the whole domain of nature, and were rewarded by an infinite number of novel discoveries. Everywhere electricity was found to be capable of explaining mysteries that had long seemed supernatural and almost divine, and of offering attractive theories that served to delight and inspire the fancy, even if they did not wholly satisfy the reason. The auroral lights that danced in lovely variety over the icy fields of the North were believed to be electrical;‡ Castor and Pollux, or the baleful Helen, that had wreathed their spectral forms around the masts of Roman ships, now created to be supernatural; the luminous rains, where every drop seemed a ball of fire, or the strange flames that sometimes hovered over armies as they went to battle, were found to be no more mysterious than the Leyden jar; the fearful roar of the thunder was known to be only the echo of the first discharge among the piles of clouds; the electric fire was traced to the waterspout, the whirlwind, or the crater of the volcano; and the triumphant inquirers at length discovered that the round world itself was only a huge electrical machine, and that all its tenants were constantly influenced by the subtle changes of the electric atmosphere.

It was soon observed that the human body was strongly influenced by the electric discharge; the blood ran quicker, the limbs were stirred, the spirits were excited, the intellect aroused;* and enthusiastic physicians recorded wonderful cures performed by the aid of electricity. Had not a panacea been discovered? Was not this strange spiritual substance nearly allied to the source of life? The idea, in the last century, excited a new thrill of expectation and awe. Electricity was applied to various forms of disease, and was often found successful in effecting a cure. It augmented the circulation of the blood, increased the pulsations and improved digestion. The paralytic were healed and made to walk again; the feeble and depressed seemed inspired with new hope. The dumb were made to speak, and the blind to see.† Bertholow, who wrote a treatise on medical electricity toward the close of the last century, relates numerous instances of cures performed by its aid, and the scientific world was full of hope in the efficacy of their new medicament. The electrical machine for a time seemed ready to alleviate the worst forms of human woe—so sanguine are men of coming good, so eager to escape from present pain! Yet the pleasing medical dream soon passed away, and it was found that even the Leyden jar was incapable of repairing the ravages of disease, or of amending those evils which men, by their own excesses, so often bring upon themselves. The dissolute noble still fell down in a paralytic fit from which even the skillful electrician, Abbé Nollet, could never awaken him‡; the uncleanly city was still full of pestilence; the poor hovel communicated its fevers to the palace.

Electricity of to-day—bridled as it is—in the hands of the modern scientist and physician, brings forth more ripened fruits. Many ailments are now amendable by the current, where other remedial agents have failed. The doctor of this age has done much towards bringing electro-therapeutics to the front rank of medical science.

This medical thunderbolt (electricity), has passed through many vicissitudes, being at one time recognized and employed at the various hospitals, and then again being thrown aside and left for the most part in the money making charlatans and quacks. Then as each new important discovery in this science has been reached, medical men's mind have again turned anew to the subject, and interest in its therapeutic properties has been awakened. But as every tide has an ebb and flood tide, so the promises of cure, there have followed failures and disappointments, which have thrown the usage of this valuable agent into disrepute, to be again, after a time, reborn and nursed into popular favor. It was during a period of 200 years in which these alterations have been taking place in the opinions held of the value of electrical treatment, and in the frequency of its employment men of science have unceasingly been persuing their investigations into its wonderful, mysterious properties and chances. New successful research on new research has been their patient reward, and to-day we have arrived at an age when practical electricity is making most rapid strides. We will see also the day when the current will be meted out to the suffering in such dosage as our remedies are meted. The time has arrived and another electro-therapeutic cloud is hanging over the medical world again. In the past few years special didactic and clinical departments have been added to the regular college curriculum in many of the foremost medical institutions. The current is once more called into service to aid in the conquering of the many maladies that physicians and surgeons are battling with. It seems that a general desire has been evinced both by members of the profession and the lay, for a more thorough knowledge of the benefits to be derived from this agent, electricity, and the best means of securing them.

One of the most astonishing of discoveries, to the intellect of this age, was the explanation now given of the wonderful properties of the torpedo and the electric eel. They were soon shown to be natural Leyden jars. The torpedo had been noticed by Aristotle and Pliny, and had long been an object of wonder and superstitious dread to the fishermen of the Mediterranean. But its electric power was feeble compared to the startling shocks conveyed by the gymnotus of the lagoons of Cayenne and South America. Humboldt has given a striking description of the vigor of this most famous of the electric fish.* He had been anxious to obtain living specimens of the gymnotus, and employed a number of the natives of the country to engage in the singular fishery. The gymnotus lives in the hot lagoons of Cayenne, covered by the thick shade of tropical vegetation, and hidden in the muddy waters. It is often more than five feet in length, and its electric shocks are so powerful that no living thing ventures to invade its retreat. Even the Indians are afraid to strike it with harpoons or to catch it with a line, since its powerful discharges benumb their arms and drive them away in terror, while the serpent-like agility of the great eel enables it to elude or destroy their nets. Humboldt, together with a party of natives, approached a lagoon filled with the electric monsters. He could not conceive how the Indians could succeed in taking their prey alive; they told him to his great surprise, that they were about to fish for them with horses.

A number of mules and horses were collected on the banks of the lagoon, and the Indians drove them, with blows and loud outcries, into the dangerous waters. A strange battle at once began. The electric eels, roused from their torpor, attacked the unfortunate invaders, fastening upon the lower parts of their bodies and giving them a succession of almost fatal shocks. Benumbed, terrified, fainting, they strove to fly from the dangerous pool, but the Indians drove them back again with wild cries and sharp blows, and the combat was renewed. The huge eels were seen rushing to assail their foes with fresh vigor, the savages, clinging to the overhanging trees and bushes, forced the horses into the midst of the water and at length, in a few minutes, the battle was decided and several of the horses sank and were drowned. The contest, says Humboldt, between animals so different in organization, in so strange a place, presented a most picturesque spectacle; it must certainly have been a most painful one. And now the victorious eels, having exhausted all their electricity, crept languidly toward the shore, where they were taken with small harpoons fastened to dry lines. So completely was their power lost that the Indians did not perceive a shock. Humboldt obtained several eels, but little injured, more than five feet long, and he was told that they were often much larger. It is a peculiar trait of the electric animals that they are produced in water, an excellent conductor, and that by some natural provision they can discharge or retain their electricity at pleasure. Philosophers now began to explain them with attention, and to form theories as to the source of their action, but the production of animal electricity seems capable of being explained only by those later theories which were soon to enlarge and adorn the science.

Thus the Eighteenth Century had elevated electricity into one of the most important and attractive branches of knowledge; it was reserved for the Nineteenth to apply it practically to the benefit of mankind. In all his brilliant and thoughtful experiments Franklin had often sighed over their apparent uselessness. He would have been amply satisfied could he have foreseen how powerful an agent his favorite science was destined to become in advancing manufactures and the arts, and in binding nations together by an almost instantaneous exchange of thought. Galvanism, the next great step in electrical progress, was discovered by Galvani, professor of anatomy at Bologna, about the year 1790.* A circumstance so accidental as the slight illness of Madam Galvani gave rise to this important event. Her physician had recommended to her a diet of frogs broth, and several of the animals, prepared for the cook, chanced to be on a table near an electrical machine. One of Galvani's assistants drew sparks from the conductors, and Madam Galvani was surprised to observe that when he did so the muscles of the frogs were distorted and assumed the appearance of life. She called Galvani to notice the strange circumstance. The experiment was repeated with success and the philosopher, who knew little of electricity, but was a careful anatomist, believed he was on the brink of discovering the principle of life. He entered with strange ardor upon the new research. He experimented incessantly upon muscles and nerves. At length he found that muscles and nerves were thrown into the singular convulsion by the mere presence of two different metals, and had discovered by accident the principle of galvanism—the source of the magnetic telegraph or the calcium light.

Still, however, Galvani persisted in his scientific delusion that he had unfolded the origin of being. He insisted that the muscles and the nerves created the electrical action. He overlooked the effect of the two metals. His disciples were soon numerous and all Europe was again roused into excitement by the unparalleled disclosures that philosophy seemed about to make. Electricity had but lately been drawn down from the clouds; the whole earth was shown to be electric; with one stride more the daring science might unfold the whole mystery of being. But, fortunately for its success, galvanism was taken from the control of its speculative discoverer and fell into more practical hands.

* Acad. des Sciences, 1752, p. 9.
† *Gentlemen's Mag.*, 1753, p. 482.
‡ De la Rive, Treat. Elect., iii, p. 169.

* Bertholow, De l'Ectricite du Corps Humain, etc., i, p. 94, *et seq.*
† Several cases of dumb persons being cured are related in the papers of the time. See *Gentlemen's Magazine*, 1752-53.
‡ Bertholow, i, p. 440. Nollet was the first to electrify the paralytic.

*Trave's, ii, pp. 113, 114.

* Becquerel, i, p. 83. See Report Historique sur les Progres des Sciences Mathematiques. Paris, 1810, p. 224.

Volta, professor of natural philosophy at Como, an excellent electrician, assailed the theory of his fellow Italian and showed that the galvanic action came from the two metals, and not from the nerves. A violent controversy raged between the Bolognese school of Galvani and the followers of Volta, and the important question of the origin of life was discussed by the philosophers and the people while Napoleon was preparing to cover Europe with carnage, and while the horrors of the Parisian massacres were yet fresh in every mind. The Reign of Terror, which had been commenced in France, was about to extend over all European civilization when the two Italian philosophers were marshaling their disciples in a vigorous intellectual combat. Volta was victorious, and his peaceful triumph will outweigh a thousandfold, in its beneficial consequences, the disastrous successes of Napoleon.

In the year 1800, a memorable epoch in the history of electricity, Volta announced to the world, in a letter to Sir Joseph Banks, his invention of a wonderful machine. It was composed of alternate sheets or layers of zinc and copper, separated from each other by disks of wet cloth. Two streams of electricity, one negative, the other positive, were found to flow from either pole of the instrument and its intensity could be increased apparently without limit by enlarging the number of the layers. He had invented the voltaic pile. Its form was afterwards changed by substituting cups of zinc instead of layers, and Volta formed a beautiful apparatus called *La Cauronne de Tasses*, the model of all those powerful instruments by which the electric current is dispatched on its useful mission from New York to San Francisco, or taught to fathom the once impassable Atlantic. The wonderful vigor of the new agent became at once apparent. The sharp sparks of Franklin's electrical machine and even the condensed shock of the Leyden jar, so long the terror of philosophers, were found to be faint and inefficient compared with the mighty electric current that flowed with silent strength from one wire to the other of the voltaic pile.

Its effect on the human frame revived Galvani's notion of the principle of life. When the hands of the operator were applied to the opposite poles, instead of a sudden shock he found himself held in the grasp of an invisible power. A series of strong convulsions ran through his arms and shoulders; scarcely could he withdraw his hands and free himself from his captor. If the instrument was applied to the forehead, a brilliant light flashed over the sight, even though the eyes were closed. The glow-worm, touched by the current, shone with increased splendor; the grasshopper chirped as if excited by a stimulant. But when the pile was applied to the trunk of a decapitated body a most horrible and unheard of phenomenon occurred. Never had such a spectacle been witnessed before since the age of miracles. The dead body rose from its recumbent position; its arms moved as if to strike in its rage objects in its vicinity; its breast heaved; its legs recovered their strength; and life was imitated or renewed in its fearful actions. Such was some of the tales told over Europe of the powers of the voltaic pile.

It was an age of excitement. Napoleon, the young conqueror of Austria and Italy, now ruled as First Consul, at Paris. The revolution had died to give place to a reign of war and violent convulsion; and Napoleon, the center and source of the impending disturbance, yet always eager for scientific novelty, invited Volta to Paris to explain his new instrument. In 1801, crowned with his peaceful victory, the Italian philosopher visited the republican court. At three meetings of the Academy of Sciences, in the presence of Napoleon and the most famous philosophers of France, Volta lectured upon his incomparable discovery.

He was crowned with the highest honors of the Institute; Napoleon loaded him with gifts and attentions, selected galvanism as his favorite branch of science, and offered a reward of sixty thousand francs to him who should produce in electricity or magnetism an impulse equal to that which had followed the invention of the voltaic pile, or the startling experiment of Franklin. Of all the excitements of the age none stirred the intellect more strongly than Volta's theories. The voltaic pile was believed to be the frame-work of the living organization. Napoleon and his philosophers were struck and impressed by the wonderful idea. "It is the image of life!" said the imperious young conqueror, as he once watched some remarkable experiments.* The brain was supposed to be an electric pile, the nerves and muscles conductors of opposing currents, and the slow beating of the heart the effect of their united action. In moments of fierce excitement positive electricity flashed from the eyes and stirred the nerves; in periods of repose the negative controlled the system. Rage, valor, achievement were positive; submission and cowardice the current from the opposite pole. On the battle-field the fierce conqueror, a terrible voltaic battery, flashed forth his electric currents in fatal profusion; his opponent yielded because his galvanic vigor had declined. The world dreamed wildly over the new machine, and men with their usual vain-glorious presumption believed themselves gods.

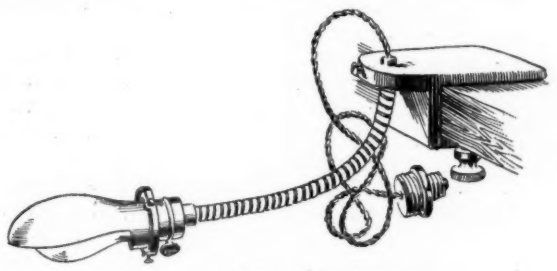
The dreams were swiftly dispelled; but a series of valuable discoveries followed rapidly the invention of the voltaic pile. The first 20 years of the present century were made illustrious by the achievements of the new machine. A splendid throng of eminent chemists and electricians sprang up under its influence, and pursued with intense labor and wonderful discoveries the path pointed out by Volta and Galvani. France, England, Germany, Europe and America united in advancing the science; and the names of Oersted and Ampere, Davy and Wallaston, Berzeluis and a great company of men of genius, scarcely inferior to their leaders, won a renown in their peaceful pursuit that shines with a softened glory amidst the fierce military excitements of that troubled age. Of these men Humphrey Davy was, perhaps, the most conspicuous. Poet, thinker, philosopher, Davy finally concentrated all the great powers of his intellect upon the study of the voltaic pile. He used it to unfold the deepest mysteries of nature. He discovered its wonderful strength, and developed all its resources. Suddenly the most solid and the least fusible substances in nature were found to melt away into gases before the steady flow of the galvanic current. Water resolved itself into its gaseous elements. The alkalies liquified and left behind them their metallic bases. New metals were discovered whose existence had never been suspected. A tremendous heat was produced that burned gold and silver as easily as paper, and that even fused the firm platinum.* A magnificent light was produced by burning potash such as man had never created before. The diamond was melted; the various earths dissolved; the composition of the air investigated; and it was believed that all the geologic changes of the surface of the globe were to beat tributed to galvanic action.

In fact, chemistry became almost a new science under the reforming influence of the voltaic pile, and the brilliant researches of Sir Humphrey Davy and his associates astonished their age by their singular novelty and their rare value to the artist and the mechanic.

Thus the dawn of the Nineteenth Century might seem to have been almost consecrated to the study of the electric forces. Yet it was also a period of unusual intellectual excitement, and while Davy, Oersted, Ampere and their associates were startling the world by a succession of wonderful discoveries, the literary atmosphere resounded with the strains of a new school of poetry. Byron, Moore, Coleridge, Wordsworth, Keats poured forth the language of passion or of reflection to countless readers, and literature united with science in aiding the progress of thought. At length, in 1820, Oersted, by a remarkable experiment, formed the indissoluble union between magnetism and electricity. The magnet, as well as the electron, had long been one of the chief mysteries of nature. Thales had observed its attractive properties, and had supposed that it was endowed with a soul. The Chinese and the Arabs knew that the magnetized needle invariably pointed to the North, and had employed it to guide their journeys by land or sea. Its variations were observed by Columbus and studied with attention by the early Dutch and English navigators; its connection with electricity had for some time been suspected, and Franklin magnetized a needle by an electrical discharge. But it is to Oersted that we owe the grand experiment by which it was shown that the motion of the magnet depended upon galvanic currents. He showed that a magnetized needle was deflected or controlled by the passage of the electric fluid along a wire. This discovery produced a new ardor in every scientific mind; Ampere, Arago, Davy, Faraday and Henry enlarged upon the thought, powerful magnets were formed by passing the voltaic fluid through a wire bound in spiral folds around an iron bar, and the principle was at length discovered upon which rests the crowning achievement of electricity—the magnetic telegraph!

We have now traced, though very briefly, the progress of knowledge of electricity from the germ of the science which lay hidden for thousands of years in amber, like the insects so often found in that substance—and yet unlike them, for it possessed immortality—up to the first practical application of that knowledge to human use and benefit. The lightning had been caged. The mighty force, which since the creation of mankind had aroused but feelings of awe and terror, could now be confined and examined, or diverted at will from its path of destruction. The wise men of the Eighteenth Century had captured the electrical Pegasus; it remained for the wiser men of the Nineteenth Century to yoke him to the plough.

It is the most poetical of the sciences as well as the most practical. Its future is full of promise, and no one can safely affirm that it may not yet achieve discoveries more wonderful than any in the past, and produce a still more beneficial effect upon the progress of man. Yet its earlier cultivators can never be forgotten, and the gratitude of their race must always attend those laborious intellects whose endless toil snatched the thunderbolt from the skies and made it the useful servant of modern civilization.



McCREARY'S NEW DESK LIGHT.

* Lardner, i, p. 113.

* Id. i, p. 133.

A New Flexible Arm Desk Light.

The accompanying illustration shows a new flexible arm desk light recently placed upon the market by the McCreary Electrical Specialty Company, 18 Cortlandt street, New York. The especial features of this light are its portability, the flexible arm and the half shade. It may be adapted to a variety of uses, but is especially applicable as a light for a typewriting desk. It can be fastened to the desk and would appear to be just the thing for such service.

LITERARY.

Scribner's Magazine for September has a notable list of contributors, including F. Marion Crawford, Thomas Nelson Page, Carl Lumholtz, Octave Thanet, Mrs. James T. Fields and Harriet Prescott Spofford. Marion Crawford writes of Bar Harbor from the point of view of one who has seen most of the Summer resorts of the world, and has spent considerable time at Bar Harbor viewing it as an outsider.

The fourth enlarged and revised edition of Prof. Silvanus P. Thompson's "Dynamo-Electric Machinery" is now ready and will be sent post free for $6 by the ELECTRICAL REVIEW Publishing Company, 13 Park Row, New York. This book has always been $9, and it is a great pleasure to be able to offer it to the electrical field at a reduction of one-third. There are new features and new plates and illustrations in the fourth edition which add greatly to its value. This work has come to be such an authority that no electrical worker's library is complete without it.

OBITUARY.

William J. Stephenson, president of the Metropolitan Railroad, of Washington, D. C., and one of the best known citizens of the district, died at his residence on August 31.

The Commercial Cable Company has declared a quarterly dividend of one and three quarters per cent,

THE PATHOLOGY AND TREATMENT OF ELECTRIC ACCIDENTS.

BY W. S. HEDLEY, M. D., EDINBURGH, IN "THE LANCET."

If the living body become the path of an electrical current of dangerous magnitude, what are the nature and sequence of the lesions that ensue, and how may death occur? Not on account of its connection with lightning stroke, nor because of a ghastly interest it may derive from the process of "electrocution," but because of those accidents that occasionally occur in connection with electric light circuits it is that this question becomes chiefly interesting. It has an obvious practical bearing on the proper treatment to be pursued in attempting the resuscitation of persons injured by such accidents—if, indeed, it be permissible to speak of electrocution as an accident—and to hint at the possibility of reanimation. One of the most useful contributions to a knowledge of this subject is a communication made by M. d'Arsonval in 1887 to the Société de Biologie; and this has recently been followed up by interesting confirmatory evidence. It is considered that the alternating currents of commerce may cause death in either of two ways: (1) By actual lesion or destruction of tissue; and (2) by arrest of respiration, producing asphyxia. In the former class death is actual and nothing can restore animation; in the latter (including electrocution) death may be, and at first often is, only apparent, recovery still being possible, and even probable, by a timely resort to artificial respiration. The following practical rule is, therefore, formulated: "Un foudroyé doit être traité comme un noyé." There is a limit, however, to this possibility of recovery. If the elevation of temperature produced by the passage of such currents exceed 45 degrees, death ensues, "as Claude Bernard has shown, by coagulation of the muscular fibres of the heart."* Should this point have been reached such cases pass into the first category of "mechanical destruction," and are not recoverable; but in accidents of the kind under consideration the contact is generally of short duration and the tetanic muscular contractions have not generally lasted long enough to induce the fatal elevation of temperature.†

It is thus considered that in cases of accidental contact with electric light wires the condition is generally one of suspended animation—of only apparent death—and that by the timely use of artificial respiration real and actual death can often be averted. In attempting the restoration of persons thus injured those repeated rhythmical tractions on the tongue, known as the "Laborde" method for the treatment of asphyxia, are advocated. It is the procedure which its originator, in his communication to the Academy of Medicine, called "the physiological treatment of death," and its technique is thus described: "With the thumb and index finger, either bare or covered by a handkerchief, the tongue is seized by its anterior third, and powerful repeated rhythmical tractions and relaxations are carried out with a frequency of about 15 to 20 times a minute. In making these tractions it is important to feel that the dragging action affects the root of the tongue. If, in attempting to seize the tongue, it is found that the jaws are closed and the teeth clenched, open them by the finger, if possible, or use as a wedge a piece of wood or the handle of a pocket-knife, or anything of the kind that may be at hand."*

In illustration of the foregoing points an interesting case of recent occurrence is cited. Its details, as given by two electrical engineers who were eye-witnesses of the occurrence, and who assisted in the efforts at restoration, are as follows: It appears that with the voltmeter registering 4,500 volts, and an amperemeter marking 750 milliamperes, an alternating current was accidentally short-circuited through the body of a man. The point of entrance was the hand, and that of emergence the buttock. The duration of contact was "certainly many minutes." More than half an hour elapsed before artificial respiration was commenced, and during that time the man showed no sign of life. Arm movements were then carried out, without apparent effect; on practicing the Laborde procedure, however, respiratory movements soon appeared, and in about two hours the man could speak. In the course of a few days he had quite recovered, excepting from the burns at the points of entry and exit. In such accidents the line of treatment to be pursued is sufficiently obvious. It is imperative that artificial respiration be promptly and patiently carried out. The pathology of the accident, however, seems by no means so simple. It is nearly a century and a half since Priestley, experimenting with Leyden jar discharges, showed that death might result from "electric shock" without structural lesion. Recent experiments, especially in electrocution, have abundantly demonstrated this. Such cases might, perhaps, come under d'Arsonval's second class, and it is allowable to speculate how far the result might have been averted by a timely resort to artificial respiration. How, then, in the absence of actual destruction of vital structures, may such accidents injure or kill? What part do the lungs, heart and nervous system, respectively, play in the morbid process? How far is the process direct, or reflex, or inhibitory? Stimuli applied through the vagus or "almost any afferent nerve" will, by reflex effects through the bulb, influence respiration, and it may probably be accepted that, if the stimulation be very strong, respiratory action may be arrested in inspiratory tetanus. So far as the heart is concerned, the inhibitory action of the vagus will come into play. Ziemssen showed in his "classic" experiments that tetanizing induction currents applied to the heart of the dog produced those irregular, arhythmic, fibrillar contractions spoken of as "delirium cordis," "caused by some change in the muscular fibres themselves." Is this change a coagulation by the heat resulting from the tetanic muscular contractions? The further experiments of Ziemssen with currents applied directly to the human heart with only pericardium intervening, as well as the experiments of Ludwig and Hoffa, of Biedermann, MacWilliam, Herbert and Dixon Mann, are familiar through the text-books of physiology. Such experiments may possibly serve as a guide to ordinary therapeutic work or as a starting point in the controversy as to the risks of vagus stimulation in such conditions as chloroform narcosis or other intoxications; but they will not tell us how a modern industrial current may injure or kill. Further direct experimentation ought to be taken up from the point where the above-named investigators have left it. Cardiographic and respiratory tracings are wanted to show in sequence of time the nature and extent of the influence on circulation, respiration and innervation of modern currents under various conditions of contact, strength, direction and duration.

* According to Halliburton, myosinogen coagulates at 56 degrees.

† M. d'Arsonval points out that the elevation of the central temperature produced by the passage of these strong currents is not due to the "resistance of the body to the passing current, in conformity with the laws of Joule, but to the violent contractions throughout the whole of the muscular system and also to the condition of asphyxia, as Dr. Brown-Séquard has shown."

* "If the case be one of drowning, at the beginning of the proceeding, whilst holding the tongue with one hand, pass the index-finger of the other hand to the back of the fauces to induce vomiting, and clear the stomach as far as possible from water, food, etc."

"La Lumiere Electrique" In Trouble.

The following circular has been issued from the editorial office of our Paris contemporary *La Lumière Electrique:*

Founded on April 15, 1879, *La Lumière Electrique*, a universal journal of electricity, has been for 15 years the most complete and authentic organ of the science to which it was devoted. It has not hesitated to make any sacrifices to insure its utility, and each year it has resulted in an average loss to its proprietor of more than 70,000 francs and at the present moment the journal is in difficulties. Two solutions have been considered by the managers: (1) To increase the rate of subscription and to open the columns of the paper to commercial advertisements; (2) to suspend the publication for a sufficient period to permit of financial reconstruction. The first solution was immediately discarded. *La Lumière Electrique* has never sought pecuniary gain and it will remain a journal of pure science, and a stranger to all commercial promiscuity. The second solution has therefore been adopted and it is hoped that subscribers, remembering the past, will be faithful to it in the future, and that they will accept patiently this momentary stoppage. Those subscribers who do not adhere to this proposal will be good enough to communicate with Counsel, M. Francis I. Delasalle, Advocate in the Civil Tribunal of the Seine, 19, Rue d'Alger, Paris.

Sulphuric Acid on the Dynamos.

TO THE EDITOR OF ELECTRICAL REVIEW:

You have probably noticed an account in the newspapers with relation to the burning out of the entire electrical equipment of the municipal plant of the city of Little Rock, and in order to get the matter straight and for your information I take the liberty of sending you the facts in the case as they have developed.

On Friday morning last the city electrician, Mr. G. E. Fish, on going to the plant to make his usual inspections discovered that the dynamos were covered with what resembled dirty water, but which afterwards proved to be sulphuric acid, which it seems was put on by some one breaking in through one of the windows and pouring it on the machines so as to utterly destroy the insulation on the armature and field coils.

The general supposition is that the work was done by an ex-engineer who is supposed to have a spite against the city by reason of his recent suspension, and in consequence he was placed under arrest.

The damage will amount to a considerable sum, and the plant has been placed in the hands of Mr. F. K. Fassett, superintendent of the Brown Electric and Machinery Company, for repairs, and with the aid of the local lighting companies the streets have been kept lighted. It will take at least three weeks to put the plant in condition again.

Yours very truly,
W. G. Brown, vice-president.
Little Rock, Ark., August 30, '94.

How to Remove Cinders from the Eye.

Nine persons out of every 10 with a cinder or any foreign substance in the eye will instantly begin to rub the eye with one hand while hunting for their handkerchief with the other. They may, and sometimes do, remove the offending cinder, but more frequently they rub until the eye becomes inflamed, bind a handkerchief around the head and go to bed. This is all wrong. The better way is not to rub the eye with the cinder in it at all, but rub the other eye as vigorously as you like.

A few years since I was riding on the engine of a fast express, says a writer in the Buffalo *Evening Times*. The engineer threw open the front window, and I caught a cinder that gave me the most excruciating pain. I began to rub the eye with both hands. "Let your eye alone and rub the other eye" (this from the engineer). I thought he was chaffing me and worked the harder. "I know you doctors think you know it all, but if you will let that eye alone and rub the other one, the cinder will be out in two minutes," persisted the engineer. I began to rub the other eye; soon I felt the cinder down near the inner canthus, and made ready to take it out. "Let it alone and keep at the well eye," shouted the doctor pro tem. I did so for a minute longer, and, looking into a small glass he gave me, found the offender on my cheek. Since then I have tried it many times, and have advised many others, and never knew it to fail in one instance, unless it was something sharp, as a piece of steel or a substance that cut into the ball and required an operation to remove it.

TELEPHONE NEWS AND COMMENT.

Elizabeth City, N. C., is to have a telephone exchange.

Clyde, N. Y., will soon have a telephone company organized.

A telephone line is to be built from Salyersville to Paintsville, Ky.

A movement is on foot to connect all the Eastern shore towns of Delaware by telephone.

Fostoria, Ohio, is to have a Citizens' Telephone Company with a capital stock of $25,000.

The Central Pennsylvania Telephone Company are ready to put in an exchange at Carbondale, Pa.

A long-distance telephone line connecting Pensacola, Fla., and the navy yard and Fort Barrancas has been completed.

The Bell company at Louisville, Ky., has about 36,000 miles of wire in operation; of this, 24,000 miles are underground.

"Haymarket office," the new exchange of the New England Telephone and Telegraph Company at the West End, of Boston, will be ready about the first of November.

The Mutual Telephone Company has been chartered to do business at Fort Scott, Kas. The directors: C. W. Goodlander, W. R. Biddle, W. P. Patterson, J. J. Stewart, H. V. Rice, W. H. Frost, J. M. Goodsell, Geo. M. Beck, J. T. Beatty, Frank Penniman and A. B. Paine.

It has been decided by the Belgian government to open negotiations with the British government for the construction of direct telephone communication from London to Brussels *via* Ostend, it being understood that should the negotiations be successful the authorities at Berlin have signified their willingness to consent to a connecting telephone line from Brussels to Berlin. It is thus highly probable that before long London will be in direct telephone communication with Berlin.

According to the official directory of the Rocky Mountain Bell Telephone Company there are 917 telephones in use on their system in Helena, Butte, Great Falls, Missoula, Bozeman, Deer Lodge, Philipsburg and Anaconda. Butte (including South Butte, Walkerville, Meaderville, Centerville and Silver Bow) heads the list with 327 instruments. Helena comes next with 256, followed by Great Falls 173, Missoula 84, Bozeman 45, Anaconda 14, Deer Lodge 11 and Philipsburg 10.

The project for the erection of telephone lines between the chief Italian cities is ready. The lines will be: Rome–Naples; Rome–Genoa, Turin; Rome–Florence, Milan; Turin–Milan; Turin–Genoa; Rome–Florence–Venice. It is subsequently intended to construct lines in connection with Paris, Berne, Berlin, Vienna and Trieste. The Italian Minister of Posts and Telegraphs has decided to send an inspector to Germany to study and report upon the organization of the telephone service in that country.

ELECTRIC LIGHT FLASHES.

Electric lights will soon be put in at Otsego, Mich.

Westminster, Md., expects to have electric light by October 1.

Findlay, Ohio, parties, in connection with outside capital, are figuring on putting in a new electric light plant.

The city of Mahoning, O., has made a seven years' contract for municipal lighting with the Mahoning Electric Light Company.

A man in Denver has a very peculiar mania. He is afraid of electric lights. He went into a hotel and demanded that a clerk pull down the arc light in the street. When captured he was wading in Cherry Creek to escape from the lights.

The Potomac Electric Light Company, of Washington, D. C., has been bought out by a St. Paul syndicate. The sale will require confirmation by the court before being completed. The purchaser of the property is Mr. Wilder, of St. Paul, Minn., who is represented by Mr. A. H. Watkins, of St. Paul. He had advanced $25,000 to the company.

The Mather Electric Company, of Manchester, Conn., report the shipment last week of two of their 1,000 light, ring type dynamos, with complete switchboard, for the new Davidson theater at Milwaukee, Wisconsin. This order was secured through Mr. J. Holt Gates, of Chicago, the well-known Western contractor of the Mather company.

Our people will do well to make haste slowly in putting money into a new electric light plant. Don't be misled by the representations of those whose only object is to dispose of a lot of machinery. There is no big bonanza in furnishing light to the city at the price it has been offered. The price paid in Middletown is almost the lowest paid anywhere in the State. So we say again, don't fool your money away.—*Middletown, Ohio, Journal.*

Benjamin A. May has been appointed receiver for the Ashtabula Water and Light Company. The action is the result of a suit commenced by the American Debenture Company, of Chicago, which claims that the Ashtabula corporation has defaulted in the payment of interest on bonded indebtedness. The company, which is incorporated under the laws of West Virginia, was organized on August 1, 1891, bonds being issued at the same time in the sum of $100,000.

Westinghouse Gets a Good Contract.

The Westinghouse Electric and Manufacturing Company, of Pittsburgh, obtained a very large contract for electric railway apparatus last week from the Chicago City Railway Company, of Chicago, amounting to 4,500 horse-power of generators, about 300 car motors, as well as the necessary switchboard appliances. This is the second contract the Westinghouse company secured from the same railway company within two years, the first one being of about the same size as this.

STREET RAILWAYS.

CONVENTION ANNOUNCEMENTS GIVING DATE AND PLACE OF MEETING.

OHIO STATE TRAMWAY ASSOCIATION.—SEPTEMBER 26.

President, A. E. Lang, Toledo; vice-president, W. J. Kelly, Columbus; secretary and treasurer, J. B. Hanna, Cleveland; Chairman Executive Committee, W. A. Lynch, Canton, O.

Meets at Toledo on the fourth Wednesday in September, 1894.

THE STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK.—SEPTEMBER 18.

D. B. Hasbrouck, president, New York city; G. Tracy Rogers, first vice-president, Binghamton; James H. Moffatt, second vice-president, Syracuse; William J. Richardson, secretary and treasurer, Brooklyn.

The next meeting will be held at Syracuse on the third Tuesday in September, 1894.

AMERICAN STREET RAILWAY ASSOCIATION.—ATLANTA, OCTOBER, 17.

Henry C. Payne, president, Milwaukee, Wis.; Wm. J. Richardson, secretary and treasurer, Brooklyn, N. Y.; W. J. Stephenson, first vice-president, Washington, D. C.; J. R. Chapman, second vice-president, Grand Rapids, Mich; Lewis Perrine, third vice-president, Trenton, N. J. Executive Committee, D. F. Longstreet, Denver, Col.; T. H. McLean, Indianapolis, Ind.; Ed. Whitacre, W. Y. Soper, Ottawa, Ont.; and E. S. Goodrich, Hartford, Conn.

Place of next meeting, Atlanta, Georgia, third Wednesday in October, 1894.

SUBJECTS FOR REPORTS AT ATLANTA.

"Can the T Rail be Satisfactorily Used in Paved Streets?" Joel Hurt, president Atlanta Consolidated Street Railway, Atlanta, Ga.; S. Hendrie, manager Wyandotte and Detroit River Railway, Detroit, Mich.; H. J. Crowley, engineer Atlanta Consolidated Street Railway, Atlanta, Ga.

"City and Suburban Electric Railways." E. C. Foster, superintendent Lynn and Boston Railroad, Boston, Mass.

"Mail, Express and Freight Service on Street Railways." R. McCulloch, electrical engineer Citizens' Railway, St. Louis.

"Best Method of Treating Accidents and Complaints." John B. Parsons, general manager West Chicago Street Railroad Company, Chicago.

"Street Car Wheels and Axles." D. S. Cook, electrical engineer Trenton Passenger Railway Company, Trenton, N. J.

"Transfer and Commutation." Rodney Curtis, president Denver Tramways Company, Denver, Col.

"T Rail Construction of the Terre Haute Street Railway Company, Terre Haute, Ind." M. F. Burke, superintendent Terre Haute Street Railway Company, Terre Haute, Ind.

"A Standard Form for Accounts for Street Railways." H. I. Bettis, consulting engineer Atlanta Consolidated Street Railway Company, Atlanta, Ga.

A member of a manufacturing company going West as far as St. Louis, wants line to sell on commission. Electrical preferred. Address,

J. D.,
BOX 1592. PHILADELPHIA, PA.

WANTED—Assistant Electrician. A large manufacturing house in Chicago, having incandescent and arc lights, is in need of an assistant electrician.

Address, with full particulars, as to age, experience, salary wanted, etc.,

"QUAY,"
Care of ELECTRICAL REVIEW,
436 The Rookery, CHICAGO

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MAGNESIA

SECTIONAL STEAM PIPE AND BOILER COVERINGS.

SELLING AGENTS:
New York, Robert A. Keasbey, 54 Warren St.
Boston, S. C. Nightingale & Childs, 134 Pearl St.
Philadelphia, Macan & Co., 1420 Callowhill St.
Baltimore, Wallace & Bro., 432 E. Pratt St.
Washington, Wm. B. Morgan, Builders' Exchange.
Chicago, Kemper & Walch, 208 Lake St.
New Orleans, Delbert Engineering Co.
Memphis, Symmes & Co., 196 Front St.

THE GREAT COAL SAVER.

MANUFACTURED BY
THE KEASBEY & MATTISON CO.,
CINCINNATI: 114 West Second St. AMBLER, PA. CLEVELAND: 117 Water St.

SELLING AGENTS:
Milwaukee, F. Sprinkman, 133 Sycamore St.
St. Louis, F. Bocler, 108 Walnut St.
Detroit, S. P. Conkling, 20 Atwater St., East.
Denver, C. W. Badgley & Co., 18th & Market Sts.
Salt Lake City, Utah & Montana Machinery Co.
Butte City, Mont., R. W. James.
San Francisco, DeSolla & Deussing, 2 California St.

KINDRED INTERESTS

The Mather Electric Company report a very large sale of their new Manchester type slow-speed stationary motors, in sizes from three to 50 horse-power. They have had so much success in the introduction of these motors that they have so far been unable to keep up their orders for this class of apparatus.

A Musical Competition.—An opportunity for "poor but gifted" youth to obtain a musical education may be had on September 29, 1894, at 3 P. M., when a competition for a $100 tuition certificate will be held at the Utica, N. Y., Conservatory of Music. Competitors must be below 18 years of age. Names of competitors must be received before September 22.

The Bristol Company, Waterbury, Conn., has issued a new and very complete catalogue of Bristol's recording instruments for pressure, temperature and electricity. The Bristol Company's electrical recording instruments now include volt, ampere and watt meters. In about two weeks this progressive company will move into a new factory, where better facilities to handle a rapidly increasing business have been provided.

"Comfort in Travel" is the title of a little brochure just issued by the Michigan Central Railroad Company, through its Eastern passenger agent, Mr. W. H. Underwood, 64 Exchange street, Buffalo, N. Y. The delights of traveling on this great railroad are set forth in alluring little gems of pictures and interesting reading matter. It is far in advance of the usual railway advertising matter, a fact which speaks well for the road by which it is issued.

Exhaust Steam Heating.—The American District Steam Company, of Lockport, N. Y., is constructing an underground steam plant for the Dunkirk and Fredonia Electric Railway Company, which is to heat the State Normal School building at Fredonia, the Union Free School building and numerous residences and other buildings in that thriving town. The heating will be with exhaust steam from the engines, supplemented by live steam as occasion requires.

Ernestus Gulick & Company, successful real estate dealers of Brooklyn, N. Y., have recently moved to new and handsome quarters in the National City Bank building, 350 Fulton street. This building is one of the finest in its line in Brooklyn, lighted throughout with electricity. It was erected under the watchful eye of Mr. Wm. Berri and his associates on the building committee of this strongly established bank. Gulick & Company now have the best location in Brooklyn for their business.

The Harrisburg Foundry and Machine Works, Harrisburg, Pa., has just issued some of the handsomest and most artistic printed matter that we have seen. It is, naturally, from the press of Bartlett & Company, New York. First in order is a little booklet in two colors describing and illustrating the well known simple and compound Harrisburg Ide and Ideal engines, which have made a good record in the electrical field. These same engines are also shown most tastefully in a series of pictures in a portfolio. The pictures resemble *remarque* proof etchings and are pretty enough to frame. Finally, there is a large catalogue exhibiting the merits of the Harrisburg double engine steam road roller. Considerable information on road building is also included in the catalogue.

That Makes a Difference.—"It seems as though the railroads were using smaller rails now than formerly," said a gentleman while traveling in the West. "Oh, no," said his companion, "you are entirely mistaken. All of the great trunk lines are laying heavier rails wherever changes are made. Your error is easily explained: You have been accustomed to traveling over the New York Central, which is equipped with 100 pound steel rails of the most durable quality, and of the most accurate size and shape; the alignment is perfect—and the rails are laid upon the sleepers with the greatest precision. This condition of the roadbed of the New York Central is necessary in order to operate the procession of great trains at a very high rate of speed, of which the most conspicuous are: The Empire State Express, the eight-hour train between New York and Buffalo; the Exposition Flyer and New York and Chicago Limited of the Lake Shore road, the North Shore Limited of the Michigan Central, and the Southwestern Limited of the 'Big Four,' all of which run to and from New York, Boston and Buffalo, Niagara Falls, Chicago, Cleveland, Cincinnati, Indianapolis and St. Louis, over the Four Track Route. The excellent equipment of this road has enabled it to operate all of these great trains without an accident or mishap of any kind."—*Medford, Mass., Mercury.*

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McINTOSH.
Will outlast anything in the market.
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ELECTRIC EQUIPMENTS FOR ROW BOATS $250. UPWARDS.

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DEALERS IN
Electrical Supplies,
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RAILS—FOR SALE

These selected second-hand T Rails in good condition to relay:
60 lb. Steel, Western Pennsylvania or Eastern Ohio delivery.
20 lb. Steel, Northern Pennsylvania delivery.
If you can use any of the above, or any second-hand 30 lb., Iron Rails, for Pennsylvania delivery, write us. We sell new Steel Rails.
ROBINSON & ORR.,
419 WOOD ST., PITTSBURGH, PA.

SEALED PROPOSALS

will be received by the City of Jackson, Tenn., until 12 o'clock noon, October 2, 1894, for furnishing, operating and maintaining 40 double arc 2,000 candle-power electric lamps on the streets of said city, with the privilege of 50 at the same price per light for a term of five years. An exclusive franchise will also be granted for all arc and incandescent lighting for both commercial and domestic use for a term of five years.

For specifications, etc., apply to
SAM. C. LANCASTER,
City Engineer.
Jackson, Tenn., Aug. 14, 1894.

WHITE-CROSBY CO.,
CONTRACTING ENGINEERS,
Equitable Building, Baltimore, Md.
New York Office, 29 Broadway.
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Dynamos and Motors AND PARTS OF SAME
ALL KINDS PRICES OF PARTS TELEPHONES ELECTRICAL SUPPLIES
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To highest bidder, a Large Six Hundred Room Hotel Annunciator. Can be made into three Two Hundred Room Annunciators by cutting case. Only used six months.
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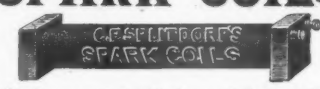

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Put your savings in an investment exempt from fluctuation in value and beyond the reach of commercial disaster.

There are no receiverships, reorganizations or repudiations possible in the promise to pay of the *Mutual Life Insurance Company.*

The income of the Mutual last year was $41,953,145.68; its outstanding insurance $708,692,552.40, and its assets $186,707,680.14.

Every desirable form of policy is issued by the Mutual Life Insurance Company.

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Best For All PATENT PERFORATED ELECTRIC LEATHER BELTING Electrical Work.

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